

Medical Education, Training, and Health Care Services in the Republic of Singapore

CHIN HIN CHEW, MD, FACP, FRCP, FRACP, *Republic of Singapore*

Singapore is an independent island city-state situated in Southeast Asia just 1 degree north of the equator. It has a land area of only 625 km² and a population of 2.75 million. Despite its relatively high population density and tropical location where epidemics still prevail, Singapore has a remarkable health record and freedom from the major infectious diseases. The city is clean, and more than 85% of the population lives in high-rise public housing apartments. The per capita income is US\$9,000 a year. The infant mortality rate of 7 per 1,000 live births and life expectancy of 74 years compare favorably with the rest of the world.^{1,2}

Medical Education and Training

The record of health services in Singapore is an account of the acceptance of Western medicine by the multiracial community. The founding in 1905 of the King Edward VII College of Medicine was a milestone in Singapore's medical history.^{3,4} This college was the predecessor of the Faculty of Medicine of the National University of Singapore, which now graduates about 200 physicians annually. There are 3,400 physicians in Singapore,⁵ a physician-to-population ratio of 1:800.

The medical undergraduate curriculum comprises five years of study and corresponds closely to that of the United Kingdom. The criteria for admission to the medical school are stringent and include top-level passes of the Singapore-Cambridge general certificate in advanced level examination in chemistry, zoology (or botany, biology), and physics, plus a successful interview. The clinical course of three years emphasizes practical bedside teaching of medicine, pediatrics, surgery, orthopedic surgery, and obstetrics and gynecology. To practice medicine in Singapore, graduates must complete a year of supervised training as an intern in hospitals recognized for this purpose. They may then seek registration as fully qualified medical practitioners with the Singapore Medical Council.

Postgraduate Medical Education and Training

Medical education is a lifelong process. All new graduates following their internship work in the medical service of the government or university for at least five years. After the first year of service, they are eligible to embark on formal training either as a specialist or in general family practice. The first period of training is three years. After successful higher professional examinations in specialties or general practice, candidates are given further opportunities for struc-

tured training in their respective disciplines for three to four more years. Thereafter they may apply for certification as a specialist and for membership in the Academy of Medicine. They are also eligible for registration as a specialist with the Singapore Medical Council.⁵ More than 30 disciplines are included in this certification process. Specialist certification is the joint responsibility of the Academy of Medicine and the School of Postgraduate Medical Studies.

The Academy of Medicine, the College of General Practitioners, and the School of Postgraduate Medical Studies

The School of Postgraduate Medical Studies is administered by a board comprising representatives from the Faculty of Medicine of the National University of Singapore, the Academy of Medicine, and the Ministry of Health. The school administers the Master of Medicine examinations, which correspond to membership or fellowship examinations of the United Kingdom or Australasian Royal Colleges. To ensure that high and corresponding standards of examinations are maintained, external examiners from the Royal Colleges are appointed.⁶ Since the establishment of the school in 1970, more than 800 physicians have successfully completed these higher examinations.

The Academy of Medicine, which was founded in 1957, is the professional corporate body for medical and dental specialists in Singapore. The Academy is patterned on the Royal Colleges in the United Kingdom and Australasia, but unlike these colleges, which are responsible for individual disciplines, this body embraces all specialties. Thus, the Academy includes all specialists and consultants in Singapore—the government service, the university, and the private sector. Its main missions are advancing the art and science of medicine, maintaining the highest standards of professional and ethical practice, and improving postgraduate education and training. Membership requirements are stringent and include a waiting period of at least eight years after graduation and at least five years of recognized experience in a specialty, three years of which must be after obtaining an approved postgraduate degree.^{4,7}

The College of General Practitioners was founded in 1971 as the professional corporate body for practitioners of family medicine in Singapore. It works closely with the Ministry of Health and the Department of Community, Occupational, and Family Medicine of the National University of Singapore and conducts examinations for membership. Phy-

(Chew CH: Medical education, training, and health care services in the Republic of Singapore. *West J Med* 1991 Aug; 155:186-188)

From the Academy of Medicine, Republic of Singapore.

Reprint requests to Chin Hin Chew, MD, FACP, FRCP, FRACP, 15 Akyab Rd, Singapore 1130, Republic of Singapore.

sicians who choose family practice as their career are encouraged to take this examination and to uphold the high standards of general practice in Singapore.⁸

Continuing Medical Education

Continuing medical education programs in Singapore include lectures, seminars, conferences, scientific meetings, and formal postgraduate courses organized by the main professional bodies and the many related specialist societies and organizations. Singapore also is a choice venue for international and regional congresses and conferences. The most recent, the 26th International Congress of Ophthalmology, attracted 10,000 participants. In addition, the College of General Practitioners and the Singapore Medical Association hold annual scientific meetings. The Academy of Medicine organizes an annual joint Singapore-Malaysia Congress of Medicine with its sister body in Malaysia, which regularly attracts international participation.⁴

Singapore has a formal voluntary continuing medical education program resembling that of the Accreditation Council for Continuing Medical Education of the United States.⁹ Physicians are also encouraged to keep abreast of advances through articles in medical journals. The two principal medical journals of Singapore are the *Annals of the Academy of Medicine* and the *Singapore Medical Journal*, both of which are internationally recognized.⁹

Health Care Services

The pattern of disease conditions in Singapore has changed over the years with improvements in the standard of living and health services. Before and immediately after World War II, the main causes of death were infectious diseases such as tuberculosis and dysentery. Today cancer, heart disease, and strokes account for more than 50% of all deaths in Singapore. The most common heart condition is ischemic heart disease, whereas the commonest types of cancer are lung, colorectal, stomach, and liver.¹

With the rapid growth in Singapore's population after World War II, a family planning and population board was established in 1966 to undertake population control. The need for Singaporeans to plan for a "two-child family" was intensively publicized. By 1975 Singapore had attained replacement level fertility, and the total fertility rate dropped to 2.07 per woman from 6.41 in 1957. This rate continued to decline alarmingly and reached an all-time low of 1.44 in 1986. New measures had to be undertaken, and a comprehensive package of generous incentives to promote a "three-child family" was introduced in 1987 to replace the population at a reasonable rate. For 1989, the rate rose to 1.93. The trend is being closely monitored.

The Ministry of Health has the overall responsibility for Singapore's health policies and administers the government health services through the Hospital, Primary Health, and Dental Divisions, supported by other paramedical and ancillary services. It works closely with the Ministry of the Environment in maintaining good environmental hygiene and control of communicable diseases and with the Ministry of Labour in monitoring industrial and occupational diseases.²

Singapore has a dual system of health care services—a public assistance system administered by the government and a private system available in private clinics and hospitals. The public has the choice of seeking medical care and services in the public or private sectors. Government health services are

heavily subsidized to ensure that health care is available to all Singaporeans.

Singapore's health care philosophy is to build a healthy community through a vigorous preventive health care program. Singaporeans are taught to be responsible for their own health and are informed of the adverse consequences of smoking, bad diet, and sedentary life-styles. Singaporeans are educated on stress-related problems and on the counseling services that are readily available in government and private centers. Close monitoring of these problems is undertaken, especially as Singapore becomes an urban and increasingly affluent society. We have an efficient and effective childhood immunization program against diseases such as tuberculosis, poliomyelitis, diphtheria, whooping cough, measles, mumps, rubella, and hepatitis B. Coverage is excellent and has led to the eradication of such life-threatening infections as poliomyelitis, diphtheria, and miliary tuberculosis.^{1,2}

Singaporeans are encouraged to build up their financial resources to meet their future health care requirements. This is achieved through a compulsory governmental savings scheme known as Medisave, with monthly contributions provided equally both by the worker and the employer. This amounts to 6% of a person's salary. The scheme allows those covered the ability to pay for their health care needs and those of their immediate family.¹⁰ This is supplemented by a voluntary governmental catastrophic illness insurance, MediShield, to cover medical expenses arising from major and prolonged illnesses.¹¹

As with other countries, Singapore's expenditure on health care has been rising; in 1988 the total expenditure of the Ministry of Health was approximately US\$280 million, or about US\$95 per capita. Most of this is spent on hospital services. The total national health expenditure for both the government and private sectors constitutes about 3% of the country's gross domestic product. Medical treatment is highly subsidized by government, being about 70% subsidized in 1988.¹

The government sector provides approximately 80% of hospital services and 30% of primary health care, and the private sector provides the balance.

Hospital services are provided through nine government-administered hospitals with about 8,000 beds and 11 private hospitals with about 1,800 beds.¹ Specialized disciplines such as cardiovascular and thoracic surgery and cardiology, neurosurgery and neurology, and plastic and reconstructive surgery are provided in three large government hospitals. Nephrology and dialysis centers, geriatric medicine, assisted reproduction, and in vitro fertilization are also available in some of these hospitals and a couple of private hospitals.

Primary health care services of the Ministry of Health are provided through a network of polyclinics.¹ The services are comprehensive and include primary general medical treatment, maternal and child health care, home nursing, day care for the elderly, and health education and counseling. Children in schools receive free medical and dental services that include periodic screening, immunization, health education, and treatment. Most curative primary health care services are provided by family physicians or general practitioners in privately owned clinics. There are in addition a number of traditional Chinese herbalists who provide basic treatment. They are not officially recognized, however, and are not permitted to prescribe drugs.

Medical Professionals

Singapore has 3,400 physicians, 600 dental surgeons, 560 pharmacists, and more than 9,600 nurses and midwives. These professionals must be registered with their respective statutory bodies—the Singapore Medical Council, the Dental Board, the Pharmacy Board, and the Singapore Nursing Board—before they are allowed to practice in Singapore. These bodies are also responsible for maintaining standards and regulating professional and ethical conduct.²

Medical Research

Extensive medical research is carried out at government or university institutions. The recent establishment of the Institute of Molecular and Cell Biology of the National University of Singapore and the Department of Clinical Research of the Ministry of Health at the Singapore General Hospital has provided a tremendous impetus to medical research, with facilities available for applied and basic medical research. In addition, collaborative projects have been undertaken with international bodies such as the World Health Organization and the British Medical Research Council.¹²

Priorities for research have been based on prevailing conditions and problems. Thus, in the late 1950s, research on the immunization of poliomyelitis led to the comprehensive administration of oral Sabin vaccine and eradication of the disease.¹³ Results of collaborative studies with the British Medical Research Council on antituberculous chemotherapy regimens since the 1960s led to the universal acceptance of these regimens in routine practice, particularly with regard to supervised and short-course chemotherapy.¹⁴⁻²⁰ Other examples are the ready adoption of hepatitis B immunization, the widespread use of bacille Calmette-Guérin vaccine in developing countries,²¹ and the eradication of diphtheria. Some other areas of intense research activities include reproductive endocrinology, population control measures, industrial dermatology, sexually transmitted diseases, oncology with particular reference to cause and treatment, immunology, and numerous therapeutic trials.

Epidemiologic studies have also been carried out. The recent problem of sudden unexpected nocturnal deaths of young Thai workers in Singapore has been documented.²² This is not peculiar to only those in Singapore; it is known to occur also in northeast Thailand. The exact cause is unknown, but it is likely to be multifactorial. Most of these research studies have been or will be published in reputable journals or presented at international conferences.

Conclusion

Singapore celebrated its 25th anniversary as an independent republic last year. With virtually no natural resources, its path to statehood, nationhood, and sovereignty has not

been easy. Indeed, many thought the country's survival as an independent nation unlikely. Nevertheless, with a strong and pragmatic government led by a remarkable generation of ministers and supported by a highly motivated and disciplined people, Singapore has not only survived but has forged ahead through rapid industrialization and hard work. It has emerged as a modern metropolis on the verge of joining the ranks of the world's developed countries. With an efficient infrastructure, Singapore has achieved an enviable reputation as a major business center in the global marketplace. Similarly in the medical fields, Singaporeans can be confident that their health care status and medical facilities will continue to improve, with the rapid advances and breakthroughs in preventive medicine, medical science, and technology and the assurance of continuing support by the government.

REFERENCES

1. Annual Report. Singapore, Ministry of Health, 1988
2. Year Book of Statistics. Singapore, Department of Statistics, 1989
3. General Information Handbook 1990-1991 Medicine, Dentistry, National University of Singapore, 1991
4. Chew CH: Postgraduate medical education and the Academy of Medicine in Singapore. *Chron R Coll Physicians Edinb* 1975; 5:17-20
5. Singapore Medical Council Annual Report, 1987
6. Wong HB: Postgraduate medical education in Singapore. *Ann Acad Med Singapore* 1982; 11:473-477
7. Lim P: The role of the colleges in the future: Academy of Medicine, Singapore, In Passmore R (Ed): *Proceedings of the Royal College of Physicians, Edinburgh, Tercentenary Congress 1981*; pp 390-392
8. General Information Booklet. Singapore, College of General Practitioners, 1987
9. Singapore Medical Council Annual Report, 1988
10. Ministry of Health: Information Booklet on Medisave, 1989
11. Ministry of Health: Information Booklet on Medishield, 1990
12. National University of Singapore 9th Annual Report, 1988-1989
13. Hale JH, Doraisingham M, Kanagaratnam K, et al: Large-scale use of Sabin type II attenuated poliovirus in Singapore during type I poliomyelitis epidemic. *Br Med J* 1959; 1:1541-1549
14. Singapore Tuberculosis Service/Brompton Hospital/British Medical Research Council: A controlled clinical trial of the role of thiacetazone-containing regimens in the treatment of pulmonary tuberculosis in Singapore. *Tubercle* 1971; 52:80-116
15. Chew CH: A national treatment survey in Singapore. *Bull Int Union Tuberc* 1972; 47:94-98
16. Singapore Tuberculosis Service/British Medical Research Council: Controlled trial of intermittent regimens of rifampicin plus isoniazid for pulmonary tuberculosis in Singapore. *Lancet* 1975; 2:1105-1109
17. Singapore Tuberculosis Service/British Medical Research Council: Clinical trial of six-month and four-month of chemotherapy in the treatment of pulmonary tuberculosis: The results up to 30 months. *Tubercle* 1981; 62:95-102
18. Singapore Tuberculosis Service/British Medical Research Council: Clinical trial of three 6-month regimens of chemotherapy given intermittently in the continuation phase in the treatment of pulmonary tuberculosis. *Am Rev Respir Dis* 1985; 132:374-378
19. Singapore Tuberculosis Service/British Medical Research Council: Five-year follow-up of a clinical trial of three 6-month regimens of chemotherapy given intermittently in the continuation phase in the treatment of pulmonary tuberculosis. *Am Rev Respir Dis* 1988; 137:1147-1150
20. Teo SK, Chew CH: Tuberculosis chemotherapy—Developments in Singapore from 1957-1982. *Ann Acad Med Singapore* 1982; 11:366-369
21. Chew CH: BCG programme in the Republic of Singapore. *Ann Acad Med Singapore* 1973; 2:90-93
22. Goh KT, Chao TC, Chew CH: Sudden nocturnal deaths among Thai construction workers in Singapore (Letter). *Lancet* 1990; 335:1154